

REMARKS

The objection to the title, set forth on page 2 of the Office Action mailed January 29, 2010, is noted. It is respectfully submitted that the newly submitted title satisfies the requirement for a new title, and is clearly indicative of the invention to which the claims are directed.

Comments by the Examiner in connection with the Abstract, set forth on pages 2 and 3 of the Office Action mailed January 29, 2010, are noted. The Examiner has not set forth any specific basis for objection to the original Abstract. In any event, Applicants have submitted a Substitute Abstract, avoiding use of legal terms such as “comprises”, and which is clearly less than 150 words; and it is respectfully submitted that this Substitute Abstract is a proper Abstract for the above-identified application.

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended claim 1 to recite that the other side of the base substrate (of the IC element) does not have any electrode formed thereon; and to recite that any of the other side of the base substrate and the electrode is connected either to the first circuit layer or the second circuit layer via a conductive adhesive agent or an anisotropic conductive adhesive agent. Note, for example, paragraphs [0024] and [0026] on pages 6 and 7 of Applicants' specification, as well as paragraph [0045] on page 13, and paragraphs [0058] on page 16, [0065] on page 18, and paragraph [0077] on page 20, of Applicants' specification. Note also paragraphs [0031]-[0034] on pages 9-11 of Applicants' specification.

In light of amendments to claim 1, Applicants have cancelled claims 2 and 4 without prejudice or disclaimer, and have amended dependencies of claims 3, 5

and 6. Moreover, Applicants have amended claims 8 and 12 to correct the spelling of “biaxial”.

In addition, Applicants have added new claims 14 and 15 to the application. Claims 14 and 15, each dependent on claim 1, respectively recites that at least one of the first and second circuit layers is a transmission and reception antenna; and recites that the first circuit layer includes a slit and operates as a transmission and reception antenna, with the second circuit layer being a bridging plate electrically connecting the IC element and the first circuit layer. Note, for example, paragraphs [0024] and [0026] on pages 6 and 7 of Applicants’ specification.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the reference applied by the Examiner in rejecting claims in the Office Action mailed January 29, 2010, that is, the teachings of U.S. Patent No. 6,459,588 to Morizumi, et al., under the provisions of 35 USC 103.

It is respectfully submitted that this reference as applied by the Examiner would have neither disclosed nor would have suggested such an electronic device as in the present claims, having the recited IC element and first and second circuit layers, with an electrode formed on a semiconductor circuit layer formed on one side of a base substrate of the IC element, and with the other side of the base substrate not having any electrode formed thereon; and, moreover, wherein the first circuit layer is electrically connected either to the other side of the base substrate or the electrode and the second circuit layer is electrically connected to that same other side of the base substrate or the electrode, whichever remains unconnected, and with the other side of the base substrate and the electrode being connected either to

the first circuit layer or the second circuit layer via a conductive adhesive agent or an anisotropic conductive adhesive agent. See claim 1.

As will be discussed in more detail infra, in Morizumi, et al., the side that does not have the terminal 12a of the IC element 12 contacts the adhesive layer 22 and is not connected to the antenna circuit 13; and, accordingly, this reference does not disclose, nor would have suggested, and in fact would have taught away from, structure as in the present claims, wherein the other side of the base substrate does not have any electrode formed thereon, with this other side being connected either to the first circuit layer or the second circuit layer via a conductive adhesive agent or an anisotropic conductive adhesive agent.

Furthermore, it is respectfully submitted that the teachings of the applied reference would have neither disclosed nor would have suggested such an electronic device as in the present claims, having features as discussed previously in connection with claim 1, and, additionally (but not limited to), wherein the conductive adhesive agent is comprised of components as in claims 3 and 5; and/or wherein the IC element is sealed by a matrix resin of anisotropic conductive adhesive agent as in claims 6 and 10; and/or wherein at least either the first or second circuit layers includes a conductive layer of aluminum or copper (see claims 7 and 11); and/or material of the base substrate on which the first and/or second circuit layer is supported, as in claims 8 and 12; and/or wherein the first and/or second circuit layer is supported on a base substrate comprised of paper, as in claims 9 and 13; and/or wherein at least one of the first and second circuit layers is a transmission and reception antenna (see claims 14 and 15), particularly wherein the first circuit layer includes a slit and operates as such antenna, and the second circuit layer is a

bridging plate electrically connecting the IC element and the first circuit layer (see claim 15).

The present invention relates to an electronic device that can be used, for example (and not to be limiting), as a non-contact type individual identification device mounted on an IC element.

In recent years, non-contact type individual identification systems that employ Radio Frequency Identification (RFID) tags have been considered, e.g., for managing the entire life cycle of a product, including production, distribution and sales thereof. Various types of such structures have been proposed, including wherein the IC element thereof has two electrodes for signal input and output formed on the same face. However, various problems exist in connection therewith, in that the two electrodes on the same face must be positionally aligned very precisely, as described in paragraph [0006] on pages 2 and 3 of Applicants' specification. Such required precision creates a substantial problem affecting mass production.

As described in paragraph [0004], on page 2 of Applicants' specification, it has also been proposed to utilize an IC element in which two electrodes are formed individually on each of the faces of a pair of facing faces of the IC element, forming a sandwich antenna construction.

However, in forming such sandwich antenna construction, each of the electrodes formed individually on each of the faces of the IC element must be extremely precise, and these electrodes have low electric resistance and are usually made of a metal having superior oxidation resistance properties, which mitigates against realizing low costs. Note paragraph [0008] on page 3 of Applicants' specification.

Against this background, Applicants provide such an electronic device, which is suitable for mass production, having good communication properties, and which can be efficiently produced at low costs. Applicants have found that where the IC element includes a base substrate formed of silicon, with a semiconductor circuit layer forming a semiconductor circuit on one side of the base substrate and an electrode formed on this semiconductor circuit layer, and with no electrode formed on the other side of the base substrate; and with the first circuit layer being electrically connected to the other side of the base substrate or the electrode and the second circuit layer being electrically connected to that same other side of the base substrate or the electrode, whichever remains unconnected, objectives according to the present invention are achieved.

It is emphasized that the electronic device of the present invention connects the other side of the base substrate of the IC element, that does not have any electrode thereon, using conductive adhesive or anisotropic conductive adhesive. Since the presently claimed structure connects both sides of the IC element either to the first or second circuit layer via the conductive adhesive or the anisotropic conductive adhesive agent, the connection of both sides of the IC element and the first and second circuit layers can be processed in a single step, thereby reducing production costs. In addition, as the connection can be processed at a low temperature, low-priced components of the base substrate and the antenna circuit can be used.

Furthermore, since the presently claimed electronic device does not have any electrode on the other side of the IC element, a step of forming electrodes on both sides of the IC element is avoided, thereby simplifying the processing and reducing cost of the electronic device including the IC element.

Morizumi, et al. discloses a noncontact IC card that transfers data in a noncontact fashion to and from an external reader/writer, the noncontact IC card being described most generally in column 1, lines 53-65, and including a card substrate; an IC chip provided on one surface of the card substrate; an antenna circuit provided on the same surface of the card substrate as the IC chip and having a pair of antenna terminals, one antenna terminal being connected to the IC chip; and a connection layer provided on an isolation layer covering a portion of the antenna circuit, and having a pair of end portions, one end portion being connected to the IC chip and the other end portion being connected to the other antenna terminal, with a protective layer provided on top of the card substrate. Note also, for example, Figs. 1 and 2, and the description in connection therewith from column 3, line 35, to column 4, line 50, of Morizumi, et al. This description discloses an IC chip 12, antenna circuit 13, isolation layer 14 and connection layer 15 provided on one surface of the card substrate 11, and a first protective layer 16a and second protective layer 16b provided so as to cover the IC chip, the antenna circuit 13, the isolation layer 14, the connection layer 15 and a capacitor 17, with the IC chip being attached on top of the card substrate 11 with an anisotropic conductive contact film 18 therebetween. Note also column 6, lines 9-17, together with Fig. 2, of Morizumi, et al., showing an IC chip provided on the anisotropic conductive adhesive film 18, with parts of the film 18 sandwiched between the terminals 12a of the IC chip 12 and the antenna terminal 13a and the IC chip connection terminal 13c being compressed, bringing the terminals 12a into contact electrically with the antenna terminals 13a and the IC chip connection terminal 13c, through the conductive particles 18b.

As can be seen from the foregoing, and particularly in Fig. 2, as well as in Fig. 3(f) and the description in connection therewith in column 6, lines 49-57, of Morizumi, et al., it is respectfully submitted that this patent document describes the antenna terminal 13a and IC chip connection terminal 13c connected to terminals 12a of the IC chip on a same side of the IC chip; and provides no disclosure of connection of the other side of the IC chip either to the first or second circuit layer via a conductive adhesive or the anisotropic conductive adhesive. It is respectfully submitted that this applied reference would have neither disclosed nor would have suggested, and in fact would have taught away from, structure as in the present claims, wherein the other side of the base substrate does not have any electrode formed thereon and wherein the first circuit layer is electrically connected either to the other side of the base substrate or the electrode and the second circuit layer is electrically connected to that same other side of the base substrate of the electrode, whichever remains unconnected, while any of the other side of the base substrate and the electrode is connected either to the first circuit layer or the second circuit layer via a conductive adhesive agent or an anisotropic conductive adhesive agent.

It is respectfully submitted that Morizumi, et al. would have neither disclosed nor would have suggested the configuration as in the present claims, wherein the other side of the base substrate of the IC element, that does not have any electrode, is also connected to the first or second circuit layer. Thus, in the case of an IC element having one electrode for input/output terminals on one side of the base substrate, as in the present claims, the other side of the base substrate of the IC element is utilized for the input/output terminal forming sandwich antenna structure through connecting either to the first or second circuit layers. This means that the

other side, while not having any electrode, also needs to be electrically connected. According to the present invention, such electrical connection of the other side is provided using the conductive adhesive or anisotropic conductive adhesive. In the process of binding the IC element using such adhesive, conductive particles in the adhesive break any oxide on the surface of the base substrate made of silicon, thereby providing stable contact resistance. Moreover, since the presently claimed structure connects both sides of the IC element either to the first or second circuit layer, via the (anisotropic) conductive adhesive, connection of both sides of the IC element and the circuit layers can be achieved in a single step, thereby reducing production costs.

The Examiner has pointed to Fig. 3 and disclosure in connection therewith, in Morizumi, et al., as disclosing an IC element of a base substrate formed of silicon, with a semiconductor circuit layer forming a semiconductor circuit on one side of the base substrate (components in 22), and an electrode formed on the semiconductor circuit layer (17). However, it is respectfully submitted that reference character 22 in Morizumi, et al., which the Examiner refers to as a semiconductor circuit layer forming a semiconductor circuit, is an adhesive layer coated on both sides of the first protective layer 16a; and that reference character 17, which the Examiner refers to as an electrode formed on the semiconductor circuit layer, is a capacitor formed on the antenna circuit 13. Thus, it is respectfully submitted that reference characters 17 and 22 correspond to members that constitute the main body of IC card 10, and do not constitute portions of the IC element 12; in contrast, the semiconductor circuit layer and electrode form part of the IC element according to the present invention. Contrary to the contention by the Examiner, it is respectfully submitted that Morizumi, et al. fails to disclose structure wherein the other side of the base substrate of the IC

element, where an electrode is not formed, is electrically connected to one of the first and second circuit layers; and also fails to disclose or suggest the IC element as in the present claims, including the semiconductor circuit layer of the IC element, as in the present claims.

Furthermore, it is again noted that Morizumi, et al. fails to disclose a configuration that the other side of the base substrate of the IC element, where an electrode is not formed, is electrically connected to one of the first and second circuit layers, especially via the conductive adhesive or anisotropic conductive adhesive, and advantages thereof providing low cost devices with stable contact resistance, as in the present invention.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims in the above-identified application are respectfully requested.

To the extent necessary, Applicants hereby petition for an extension of time under 37 CFR 1.136. Kindly charge any shortage of fees due in connection with the filing of this paper, including any extension of time fees, to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Account No. 01-2135 (case 1204.46479X00), and please credit any overpayments to such Deposit Account.

Respectfully submitted,

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Attachment: Substitute Abstract

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